

STUDIES IN AUSTRALIAN EMBIOPTERA.

PART II. FURTHER NOTES ON SYSTEMATICS.

By CONSETT DAVIS, B.Sc.

(From the Zoology Department, Sydney University.)

(Plate xii; seven Text-figures.)

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Since the completion of the first paper of this series (Davis, 1936), two interesting new species have been discovered. Since material of both of these species is being used for anatomical and embryological study, it is necessary to describe them forthwith. This paper is accordingly to be regarded as supplementary to the former paper, and the prefatory remarks to, and methods used in, that paper apply here also.

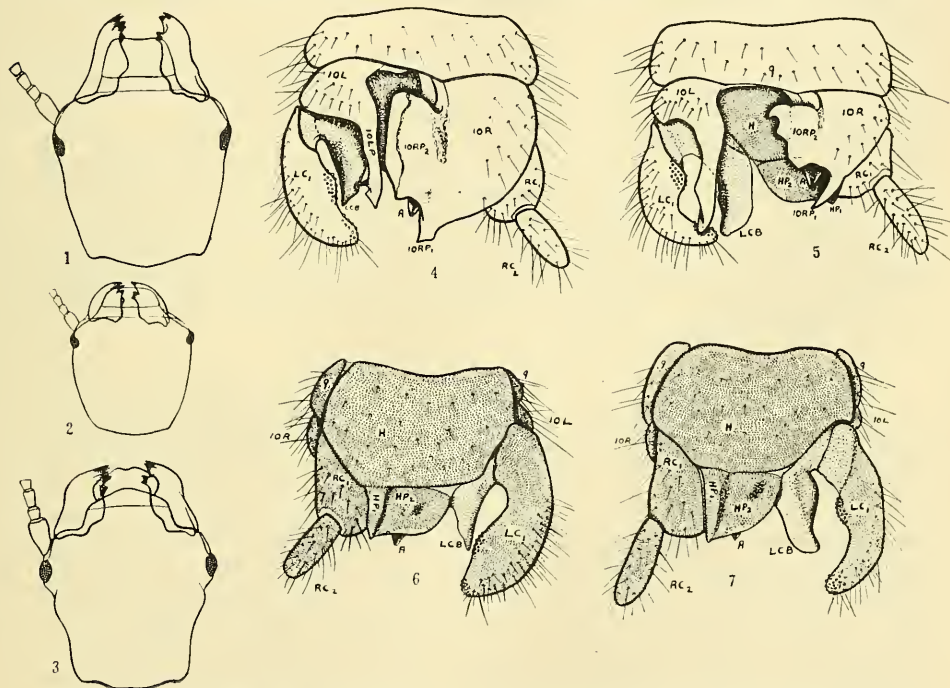
Genus METOLIGOTOMA Davis.

METOLIGOTOMA PENTANESIANA, n. sp. Figs. 1, 2, 4, 6.

♂.—Length 6.3–9.7 mm., av. 8.0 mm. Ratio head:thorax:abdomen, 10:16:22 (lengths). *Colour*: Living specimens appear dull greyish-brown to the naked eye. Details of the colour of preserved specimens are as follows: Head deep golden-brown with darker symmetrical tracery, eyes black. Sclerites of thorax and abdomen, dorsally dark brown, paler symmetrical pattern on pronotum, paler mottling on mesoscutum and metascutum, and paler mid-dorsal line in abdominal region (as in *M. reducta reducta* m., ♀). Ventrally, sclerites brown with paler areas, especially on anterior abdominal sternites; hypandrium very dark brown. Segments of antennae, legs and cerci golden-brown. Intersegmental membranes cream. *Head*: Length 1.40–2.12 mm., av. 1.69 mm. Ratio of length to maximum breadth 10.0:8.1. The variation in head-structure in adult males is interesting, some (fig. 1) having the head with almost straight lateral margins, converging posteriorly, as in *M. reducta reducta* m., ♂; in others (fig. 2), the lateral margins of the head are noticeably convex, and rounded off posteriorly, as in adult females of the family—that is, the larval form is fairly closely retained. Mature males with larviform heads have been noted very rarely in *M. reducta reducta* m. and *M. reducta ingens* m., but in this species the occurrence is frequent. *Antennae*: Maximum number of segments observed, 18; maximum total length, 3.6 mm. Four basal segments with lengths typically in the ratio 5:2:3:2; distalia subcylindrical, margins straight and diverging distally. *Mouthparts* with mandibles similar to those of *M. reducta reducta* m., ♂: the left with two sharp, inwardly-directed teeth distally, two blunter teeth behind these, and posterior to them a blunt process on the inner margin; the right with two fairly sharp distal teeth, directed inwards, and a bilobed tooth behind these on the inner margin (fig. 1). In males with head-structure approaching larviform, the mandibles are intermediate between those described above and those present in the immature stages (fig. 2). *Thorax*,

legs and abdomen (except terminalia) as in *M. reducta reducta* m., ♂. Wings absent.

Terminalia (figs. 4, 6): Tenth tergite divided longitudinally into left and right hemitergites (10 L, 10 R respectively). 10 R and its processes 10 RP₁, 10 RP₂, similar in general form to those in *M. reducta reducta* m., but with 10 RP₁ terminating more bluntly, and 10 RP₂ of different form, the left-hand part being only very weakly chitinized. Segments of right cercus (RC₁, RC₂) as in *M. reducta reducta* m.; 10 L small, and giving rise to a process (10 LP) from the posterior limit of its inner margin. 10 LP sinuous, somewhat slender, ending bluntly, and giving off dorsally a sharp spine, directed towards the left, near its posterior extremity. Left cercus (LC₁) one-segmented, with minute nodules at its posterior extremity and on a rounded protuberance half-way along its inner margin. Left cercus-basipodite (LCB) projecting backwards between base of LC₁ and hypandrium to a tapered point; LCB membranous except along its outer margin. Right cercus-basipodite wanting. Hypandrium (H) and its



Figs. 1-3.—Dorsal view of heads of adult males, showing mandible structure. × 124. 1. *Metoligotoma pentanesiana*, nov., fully developed head; 2. *M. pentanesiana*, nov., head capsule of mature male retaining larviform features; 3. *M. extorris*, nov.

Figs. 4-5.—Dorsal view of male terminalia. × 25. 4. *M. pentanesiana*, nov.; 5. *M. extorris*, nov.

Figs. 6-7.—Ventral view of male terminalia, certain dorsal structures omitted. × 25. 6. *M. pentanesiana*, nov. 7. *M. extorris*, nov.

(9. Ninth abdominal tergite; 10 L, 10 R, left and right hemitergites of tenth abdominal segment; 10 LP, process of 10 L; 10 RP₁, 10 RP₂, outer and inner processes of 10 R; RC₁, RC₂, first and second segments of right cercus; LC₁, one-segmented left cercus; LCB, left cercus-basipodite; H, hypandrium; HP₁, HP₂, appendages of H; A, membranous structure possibly representing aedeagus.)

appendages (HP₁, HP₂) as in *M. reducta reducta* m. Between HP₂ and 10 RP₂ there projects a conical, membranous structure, chitinized medially (A); this may represent the aedeagus, but appears to be placed further dorsad than usual for this structure, so that it may belong morphologically, not to the aedeagus, but to the right hemitergite.

♀.—*Length* 8.0–10.6 mm., av. 9.4 mm. *Head:thorax:abdomen* in the ratio 10:19:27. *Colour*: Living specimens appear dark brown, without the greyish hue seen in the male; and there is more of the cream intersegmental membrane in evidence. In detail, preserved specimens have the same coloration as the male, somewhat paler, and the sternites around the genital aperture are very dark brown. *Head*: *Length* 1.47–1.82 mm., av. 1.69 mm. Ratio of length to maximum breadth, 10.0:8.5. Structure normal for the family. *Antennae*: Maximum number of segments observed, 16; maximum total length, 2.6 mm. Segments as in *M. reducta reducta* m., ♀. *All other characters* as in *M. reducta reducta* m., ♀.

Habitat.—Most northerly of the Five Islands, near Port Kembla, N.S.W., the author, 2.8.36 (paratype ♂) and 13.9.26 (holotype ♂, allotype ♀ and long series of paratype ♂ and ♀).

The island on which the insects were collected is an isolated trachy-andesite mass, more than a mile from the shore. The portion of the island not subject to wave action is approximately 100 yards in diameter (Pl. xii, fig. 1).

Situation.—Forming galleries under and between stones, among dead vegetation (especially of *Enchytaena tomentosa* and *Mesembryanthemum aequilaterale*), and among the fleshy stocks of the herb *Plectranthus parviflorus*.

Disposition of Types.—Holotype ♂ (in clove oil), allotype ♀ and paratype ♂ (in alcohol), Macleay Museum, Sydney University. Paratype males and females forwarded to the British Museum, the Australian Museum, the National Museum, the South Australian Museum, the Western Australian Museum, the C.S.I.R. collection, the Cawthron Institute and the Leyden Museum.

METOLIGOTOMA EXTORRIS, n. sp. Figs. 3, 5, 7.

♂.—*Length* 11.4–14.1 mm., av. 12.5 mm. *Head:thorax:abdomen* in the ratio 10:17:23. *Colour*: Head black, tergites of thorax and abdomen dark brown, the pronotum with paler symmetrical pattern, the mesoscutum and metascutum with a paler median line fading out in the abdominal region. Ventrally, sclerites brown with paler areas, especially in the abdominal region. Hypandrium very dark brown; segments of legs golden-brown, of cerci and antennae dark brown. Intersegmental membranes cream. *Head* (fig. 3): *Length* 2.23–2.77 mm., av. 2.51 mm. Ratio of length to maximum breadth, 10.0:7.9. Eyes small, but prominent for the genus; behind the eyes the lateral margins of the head expand in another protuberance, then converge to the posterior limit, where a fairly sharp angle is formed on each side. *Antennae*: Maximum number of segments observed, 18; maximum total length, 4.1 mm. Four basal segments with lengths typically in the ratio 5:2:3:2; distalia as in the previous species. *Mouth parts* with mandibles (fig. 3) having teeth disposed as in the previous species. *Thorax, legs and abdomen* (except terminalia) as in *M. reducta reducta* m., ♂. *Wings* absent.

Terminalia (figs. 5, 7): Disposition as in *M. reducta reducta* m. and *M. pentanesiana*, nov., with the following points of difference: (1) The process 10 RP₁ is slender and smoothly tapered; (2) the process 10 RP₂ is of different shape, and the left-hand margin, weakly chitinized, has a crenulate appearance; (3) the process 10 LP, simple in *M. reducta* m. and subspecies, and bearing a prominent spine in *M. pentanesiana*, nov., has a slight dorsal projection near its

termination. 10 LP is somewhat stouter than in the other species, and 10 L smaller; (4) the left cercus (LC₁) curves in distally to a finger-shaped process, bearing minute nodules; minute nodules are also present on a rounded protuberance on the inner margin of LC₁; (5) the left cercus-basipodite (LCB) is a very large membraneous structure, running back to a rounded extremity. LCB chitinized only along its outer margin.

♀.—*Length* 9.4–15.0 mm., av. 12.2 mm. *Head:thorax:abdomen* in the ratio 10:23:35. *Colour*: Head golden-brown with dark brown symmetrical tracery. Tergites of thorax and abdomen dark brown, pronotum with golden-brown symmetrical pattern, mesoscutum and metascutum with paler mottling, abdominal tergites with a pale mid-dorsal line. Ventrally dark brown with paler areas; abdominal sternites 1–7 dark only at lateral margins, abdominal pleurites dark brown. Sternites 8 and 9 dark throughout. Segments of antennae, legs and cerci golden-brown; intersegmental membranes cream. *Head*: Length 1.53–2.12 mm., av. 1.79 mm. Ratio of length to maximum breadth, 10.0:8.0. Structure normal for the family. *Antennae*: Maximum number of segments observed, 18; maximum total length 3.1 mm. Segments as in *M. reducta reducta* m., ♀. *All other characters* as in *M. reducta reducta* m., ♀.

Habitat.—Brush Island, near Ulladulla, N.S.W., the author, 6.9.36 (holotype ♂, allotype ♀, paratype males and females). Brush Island (Pl. xii, figs. 2, 3) is a doleritic mass, approximately half a mile in length, less than half a mile from the mainland at Murramarang Point, some twenty miles south of Ulladulla.

Situation.—Forming galleries amongst dead vegetation, particularly inside the hollow stems of dead plants of *Tetragonia expansa*.

Disposition of Types.—Holotype ♂ (in clove oil), allotype ♀ and paratype ♂ (in alcohol), Macleay Museum. Paratype males and females forwarded to the British Museum, the Western Australian Museum and the National Museum.

Key to the Species of Metoligotoma (♂).

- 1. Left cercus finger-shaped distally (fig. 5) *extorris*, nov.
 Left cercus not as above 2
- 2. Process of left hemitergite of tenth abdominal segment simple *reducta* m.
 Process of left hemitergite of tenth abdominal segment with a prominent dorsal spine *pentanesiana*, nov.

Discussion.

The species *Metoligotoma extorris* and *M. pentanesiana* are interesting from the point of view of evolution; both apparently represent species formed under the influence of isolation by some form of orthogenesis (in the literal sense, that is, not implying any directive force).

Both islands have been separated from the mainland by erosion of sedimentary rocks lying between, and it is probable that a large part of the fauna and flora is relict from the time of separation.

The environment is similar in each case, though varying slightly from that on the mainland.

The developments of the process of the left hemitergite of the tenth abdominal segment are particularly important, when we remember that this process has developed a forcipate appendage twice within the order by convergence (*Rhagadochir* spp., *Oligotoma tillyardi* m.). The spine developed in *M. pentanesiana* appears to be the initiation of a similar structure, but as yet it would appear to have no functional importance, as in *O. tillyardi* m., so that an explanation of its development by selection would be incorrect.

Reference.

- DAVIS, C., 1936.—Studies in Australian Embioptera, Part I: Systematics. PROC. LINN. Soc. N.S.W., Vol. lxi, p. 229.

EXPLANATION OF PLATE XII.

- Fig. 1.—Most northerly of the Five Islands, off Port Kembla, N.S.W.
Fig. 2.—Brush Island and Murramarang Point, near Ulladulla, N.S.W.
Fig. 3.—Situation on Brush Island where *Metoligotoma extorris* occurs.
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